

## REPORT OF CASES OF OPERATIVE RELIEF OF ENDOCRANIAL HÆMORRHAGE.

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TRAUMATIC endocranial hæmorrhage, when severe enough to produce symptoms, demands operative interference in every instance. Although some few still hold that when the hæmorrhage is so small as to produce only light symptoms, no operation should be done, I think that in view of the very serious damage that may result from any pathological condition within the cranium, every hæmorrhage, however small, if sufficiently large, and so located as to produce diagnostic symptoms, should be removed.

The removal of extra-dural hæmorrhage is attended with very little danger if there has been no serious brain injury resulting from the same cause which caused the hæmorrhage.

Profuse hæmorrhage from the middle meningeal, or its larger branches, or the larger cerebral arteries, may demand interference to save life. In this case, of course, any operation would be justifiable.

While it is yet impossible to say whether a hæmorrhage is intra- or extra-dural—and while the operation for hæmorrhage without the dura is much less serious than one within—nevertheless the operation for intra-dural hæmorrhage, where the brain has received only a small injury—is fairly devoid of danger; and the only difficulty attending the removal of the clot appears to be the hæmorrhage from the injured vessel. But this seems to have been readily controlled in most of the cases in which operations have been made.

This, of course, refers only to such as have been operated on very soon after the reception of the injury. And, as far as I

know, Case No. I, reported below, is the only one in which an operation has been done within so short a time after the hæmorrhage begun; and the only one sub-dural in location in which there was no indication of traumatism upon the skull itself.

The two cases described below have been seen and operated upon by myself within the last two years.

CASE I.—*Injury of Head; no Scalp Wound; no Fracture; Paralysis of Right Side; Large Intra-dural Clot on Left Side of Brain. Operation. Recovery.*—September 26, 1891; A. M., aged twenty; laborer; large and stout; right-handed; after having been struck on his head with a large stick was seen to stagger, but not fall; he then walked fifty or sixty yards, and sat on a low fence; he did not speak, and appeared dazed; after a few moments his head was seen to turn violently to one side, and, at once, he had a general convulsion; water was poured on his head, and in a short time the convulsion disappeared; he was then carried toward a house near by; he now could not walk alone, nor speak; on the way he had another convulsion, which lasted longer than the previous one; on its disappearance he was much more helpless, and in a much worse condition than before.

He was now lifted bodily, carried into the house, and placed on a bed. I saw him an hour later, and found him lying on a bed with his legs slightly separated, and his arms lying out from his side. His pupils were slightly dilated—the left somewhat more than the right; they reacted slightly to light; his pulse was fifty to the minute, and full; his respiration was ten to the minute, and stertorous; his left arm and leg moved occasionally; his right leg was movable, but soon ceased to be so; the right face and arm were paralyzed; loud calling provoked no response; the temperature was not taken, but the skin felt cold, and was covered with slight perspiration; an examination of the head showed no fracture and no injury of scalp; head shaved at once, and still found no evidence of injury; head was carefully washed with soap, afterwards with ether—and a towel wet with one to twenty carbolic acid solution applied; this was kept saturated for about two hours—all symptoms growing worse; pulse went down to forty-four per minute; respiration to eight; the coma deepened; the right face, arm, and leg were completely paralyzed; the left arm and leg were moved occasionally, but movements became less marked.

Death seeming imminent I proceeded to operate, having the assistance of Drs. Rea, Holmes and Kirby. With every precaution preparations for the operation were made. All instruments were sterilized by heat—so were the silk ligatures, towels, and sheets.

Solutions of carbolic acid, bichloride and Thiersch's solution, were made from sterilized water. The head was rewashed in 1 to 1000 bichloride solution, and the sterilized sheet, wrung out of the same solution, was fastened around the neck.

I had decided to open the skull in such a way as to expose the



FIG. 1.—Showing location of clot in Case I.

arm centre. The fissure of Rolando had been marked off on the scalp immediately after the scalp was shaved according to the Thane-Horsley method. A small nail was driven through the scalp to mark the skull. A large horse-shoe flap was made, with base forward and downward. After the flap was raised the first evidence of traumatism was seen. The periosteum was detached over a portion of skull somewhat larger than a quarter of a dollar just posterior to the coronal suture, represented by the upper border of the inside ring of Fig. 1. The inner ring also represents the opening made in the skull.

The presence of this evidence of injury decided me to trephine there instead of over the arm centre. The trephine was three-quarters of an inch broad, and I had decided beforehand to make three or four openings and saw them into one. The trephine at first was applied to the upper part. The bone was very hard and thin, and bled very little. There was almost complete absence of diplœe. When the first button was removed there were no signs of extradural hæmorrhage, but the dura bulged into the opening, was discolored and exceedingly tense, and did not pulsate. I was satisfied that I was upon the clot. Another trephine opening was made just below the first, the upper margin of the trephine cutting the dura. The intervening piece of bone was rapidly cut away with bone forceps. Small particles of blood clot were forced out through the opening made in the dura by the trephine.

The opening in the dura was enlarged with curved, blunt-pointed eye scissors, and a large amount of blood, not very firmly coagulated, came out. The nozzle of a fountain syringe, sterilized, was introduced into the opening of the dura, and the rest of the clot washed out with a gentle stream of Thiersch's solution. I estimated the amount of blood to be between three and four ounces, possibly more.

The hæmorrhage was from a branch of the ascending frontal artery, which was secured after some little difficulty, and ligated with catgut, the point of rupture in the artery corresponding with the dot in the central ring of Fig. 1. This was at the lower border of the portion of skull from which the dura had been loosened by the blow.

The wisdom of making the opening through the skull at this place was shown by the result; for, it will be seen, that the point of hæmorrhage would not have been revealed had the opening been made immediately over the arm centre, unless it had been made very large, which is not necessary if the bleeding artery can be found through a smaller opening.

I took one stitch of catgut into the free border of the dural incision, leaving three or four strands of sterilized silk on either side of the stitch. These I brought out of the lower border of the flap with the other drains.

The patient was examined at this stage of the operation. Breathing and respiration were much increased. The flap was sewed in place with long silk threads, which were tied in bow-knots and left long, so as to allow reopening, should this be necessary, without the necessity of making new stitches. A piece of iodoform gauze, wrung

out of a 1 to 2000 sublimate solution, was placed in the lowest border of the wound for drainage. Several layers of iodoform gauze, wet with the same solution, were applied on the scalp; several layers of sublimate gauze over this, firmly fixed by bandage, completed the dressing.

According to my most accurate estimate the distribution of the hæmorrhage was about as shown in the large circle on Fig. 1.

At the close of the operation the patient's pulse was a little less than 100, and respiration about twenty per minute; otherwise his condition appeared unchanged. No anæsthetic was used during the operation. The patient was placed comfortably in bed and allowed to remain until late in the afternoon, when, without my knowledge, he was carried on a litter to his home, a distance of half a mile.

His temperature at nine o'clock P.M. was  $99\frac{3}{4}^{\circ}$ ; pulse and respiration little changed. He had not spoken, nor had any movements been seen. Later at night his left leg and arm were moved occasionally, but the right side was still paralyzed. He had not spoken since the injury.

September 27.—The symptoms appeared better. Some movements of right leg and arm had taken place. His urine had been drawn with catheter. Would open his eyes when spoken to loudly, but did not speak nor seem to understand what was said to him. The dressing was saturated with blood and cerebro-spinal fluid, but was not changed. Later in the day the patient grew nervous and restless; was able to swallow, and some bromide of potash was given him. Urine was passed voluntarily, but the pulse and respiration remained about the same; temperature  $99^{\circ}$ .

September 28.—Could speak, using monosyllables; seemed to understand when spoken to; wanted to sit up and did so while head was dressed; bowels moved. The strip of iodoform gauze and silk threads were removed; with them came more than half an ounce of blood, mixed with cerebro-spinal fluid. The dressing was made as before, with a strip of gauze replaced at the lower border of the incision. The recovery from this period was uneventful. The temperature never went above normal after the first dressing.

On the fourth day after the operation he was able to walk about in the room; his speech had improved, and the paralysis of his right side was rapidly disappearing.

On the fifth day all the stitches and the gauze drain were removed. The union was perfect except at the point of drainage.

There had ceased to be any discharge, except a small amount of transparent fluid. Head was dressed as before and the patient continued to improve.

On the eleventh day after the operation the dressing was replaced by a warm cap for protection and the patient was dismissed, able to walk. His speech had become almost natural, and the hands only in the finer movements showed the effect of the previous paralysis. The patient later resumed his occupation as a laborer, and now (1893) states he feels no inconvenience whatever as a result of his injury.

CASE II.—*Paresis of Right Arm and Leg; Partial Word Blindness and Agraphic Faults; Extra-dural Hæmorrhage Over Left Side of Brain. Operation. Recovery.*—G. R., aged fifteen years; quite large for his age; school boy; right-handed; was struck a severe blow on his head by an adult man. He fell to the ground, but got up and walked toward the house, accompanied by several small boys. After going some distance, probably a mile, "he fell down and shook all over." After some time he recovered, but found he could only walk with difficulty. With the aid of his companions he was enabled to reach the home of his uncle, where he spent the night.

March 27, 1893.—Dr. B. F. Rea, Jr., was called to see him. He found him in bed, fairly comfortable; his mind was apparently quite clear; he was able to talk and to explain the occurrence of the day before with the exception of the spasm, of which he had no memory.

At the invitation of Dr. Rea I saw him later. I found him in bed comfortable, except for an occasional paroxysm of severe headache, the right side of head being the most painful. There was no paresis of face; the eyes were natural, but the right arm and leg were paretic.

I examined his head carefully, but could find no evidence of fracture, although there was a little thickening of the scalp over the right occipital bone, of which he complained, and over the left parietal bone, near the median line of the skull, and just posterior to the upper end of the fissure of Rolando was another spot of thickened scalp, which gave pain only on deep pressure. The grasp of the right hand was less than half that of the left. The pain sense while not destroyed was greatly inhibited. The temperature sense was somewhat interfered with. His arm could be moved, but none of

the delicate movements of fingers, hand or forearm could be made. He could not tell the difference by touch between my silk handkerchief and the woolen blanket on his bed. A half dollar put in the palm of his hand he called a dollar. He said a wooden dumbbell, weighing half-pound, weighed about five pounds. The right foot, toes and leg were somewhat more paralyzed than the arm. The other senses were in nearly the same condition as in the arm.

He was able to read, but I thought with some difficulty, and he said he was not able to read at all; but on giving him a book he succeeded in reading, but with evident difficulty. His eyesight was otherwise normal. When told to write he could not do it, but made figures, as well as could be expected, with his left hand. When directed to walk he got up on the side of the bed, and, after fixing himself, was able to drag his right leg across the room with the aid of some one at his side, his arm hanging loosely.

These conditions of mental disturbance lasted longer than the paresis, his muscular sense being the last to be completely restored.

At my first examination, made two days after the operation, he read quite easily, but still claimed that he could not write; but did succeed in writing, but not with the same facility that he did ten days after the operation.

After my first examination I thought it best to prepare for an operation. So he was sent home, his head was shaved and antiseptics were applied.

The next morning I examined him carefully again. All the conditions remained the same, except a slight increase in their intensity. His headache had been quite severe, necessitating an occasional hypodermic injection of morphine and atropia for its relief. Another careful examination of his head revealed nothing more.

His temperature remained about 99°. He had no appetite, was exceedingly irritable and complained constantly of a vague something about his head, which he described as "something wrong with my head." The headache grew worse, and required morphine more regularly for its relief. His bowels and bladder were normal.

There was no material change, except a gradual intensification of all the symptoms, until noon of the fourth day after the injury, when an operation was performed. The scalp had been frequently washed and kept covered with a solution of carbolic acid, 1 to 40, until six hours before the operation, when a solution of sublimate of 1 to 2000 was applied.

Some days previous to the operation I had marked off the chief fissures on the skull. Preparations for the operation were made as in Case I, and the assistance of Drs. Rea and Grady was obtained.

A very large horseshoe-shaped flap was made, the upper border of it beginning just to the left of the median line of the skull. Before finishing the flap I forced my finger between it and the bone, down just beneath the spot of scalp, which had previously shown signs of injury.

I was enabled to feel a slight fracture of the skull. I then continued the incision in flap, not going as far forward as I should have done had I failed to have found the injury of bone, as it was some little distance behind the fissure of Rolando. The scalp wound bled profusely, and the hæmorrhage was only controlled by grasping the full thickness of the scalp with many hæmostatic forceps.

The periosteum was easily raised from the bone, revealing, as marked in Fig. 2, by the inside circle, the location of a very slightly depressed circular fracture, with a border so smooth that it had been impossible to find it before the scalp had been turned back. Blood oozed from the whole surface of the fractured bone. An attempt was made to apply a trephine over the margin of the depression, but the bone was very soft and the blood came up profusely. The trephine was then laid aside, and with an elevator the whole of the external plate was lifted up in one piece, it breaking loose from the whole circumference of the fracture. The hæmorrhage was alarming. The blood rushed out from every direction, pressure having no effect. I at once forced the elevator through the internal table and turned it out as rapidly as possible. The hæmorrhage was so great that I could not see what lay beneath. But, as rapidly as possible, I crushed together the internal and external plate around the whole of the circumference of the opening in the skull with a pair of strong needle forceps. This stopped the hæmorrhage effectually. I then found a tarry, very firm blood clot underneath. It required the steel handle of a knife to displace it. Just underneath the centre of the opening in the skull it measured three-quarters of an inch in thickness, and I estimated it to extend about as shown by the larger marking in Fig. 2. Perhaps the clot was larger.

The amount of clot must have been between two and three ounces, all of which was removed with a knife handle and a stout stream of bichloride solution.

The hæmorrhage had in all probability ceased some time before



the operation was made; but a slight hæmorrhage from a branch of the posterior meningeal, which came up after removal of clot, was effectually stopped by packing with iodoform gauze, which was allowed to remain for twenty-four hours.

I can but think, however, that a greater part of the hæmorrhage was from the sinuses in the bone injured at the point of fracture.

After the clot had been removed the patient showed much more shock than I had expected to see; and had it been an operation requiring further procedure, as in case of tumor, I should have closed



FIG. 2.—Showing location of clot in Case II.

the flap over a thoroughly-disinfected piece of rubber tissue, taken a few stitches, dressed carefully, and waited several days before proceeding further. It is not difficult to conceive of such cases when this procedure would be of great benefit, especially when much hæmorrhage has occurred from scalp wounds, or where much time has been consumed in opening bone and where much shock has followed.

In this case, after packing the cavity lightly at point of hæmorrhage from dura, I placed two layers of iodoform gauze between the skull and flap, taking stitches with long threads in flaps tied in bow

knot, and dressed with iodoform gauze wrung out of 1 to 2000 sublimate solution. This was covered with double cyanide gauze wrung out of same solution, and fixed securely with bandages. Gauze drains had been put in at the lowest border of the incision. It had been necessary to ligate no arteries in the flaps.

When the operation was completed the patient showed considerable shock. He was placed comfortably in bed and artificial warmth applied. In the course of a few hours he reacted fairly well. Sufficient hæmorrhage continued to slightly moisten the dressings.

The next day at twelve the dressings were changed to remove the packing. The long sutures were untied, the flap easily raised except at upper border, where no gauze had been left. Here it was quite firmly united, requiring some little force to separate it. The inner surface of the flap had grown into the meshes of the gauze, requiring force to separate them. This was followed by quite a hæmorrhage, which pressure effectually controlled. The packing was removed; the hæmorrhage had ceased, and the brain quite filled the cranial cavity. The long sutures were tied and cut short, the gauze drain placed in the lower border of the incision, and the dressing made as before.

On the fifth day after the operation, all the stitches and drains were removed; the union was perfect except at the drainage point. The head was redressed as before. The temperature had reached 99° each afternoon, though it was normal each forenoon; the headache remained unchanged, requiring two or three injections of morphine daily to relieve it; appetite was poor, but was improving slightly.

From the second day after the operation the patient occasionally got up and walked about the room; his pulse had increased from a little less than seventy before the operation to between eighty-five to ninety, at which point it remained for some time. This, I attribute more to hæmorrhage which occurred during operation than to anything else. The paresis of hand and arm gradually disappeared from the day after the operation until he was discharged on the eighth day after the operation. At that time he walked with very little limp. He was able to use his hand much better, being able to button his coat or pants, but with a noticeable degree of awkwardness. His condition, otherwise, was as described above. At this time, June, 1893, he shows no indications of the injury.